Metronome Documentation

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# Feasibility Study

I would like to make a metronome. A metronome is a device which has a clock hand that bounces back and forth and the number of times this happens per minute can be changed. It is used by musicians and others to keep in time. We will make it web based and ensure it can be used on multiple devices.

I know the problem is solvable because calculating the number of sounds made per minute can be calculated in a finite number of steps and reasonable time. This is calculated by converting a BPM into a required delay using a theoretical approach.

The budget is limited(£0) and we have 2 weeks to complete the project.

# Analysis

## Stakeholders

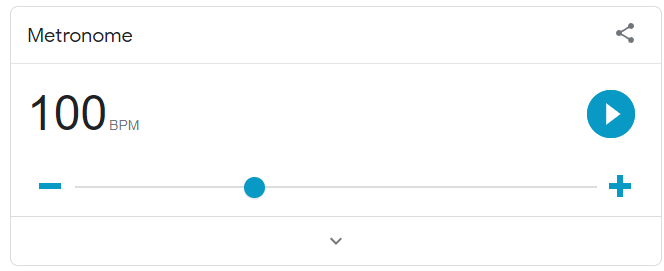
Henry is a 16-year-old who loves to play guitar on a weekly basis. He has a great interest in a metronome that could help to keep him in time when playing. Sometimes he may be using a mobile device but may also use a tablet or computer.

## Research

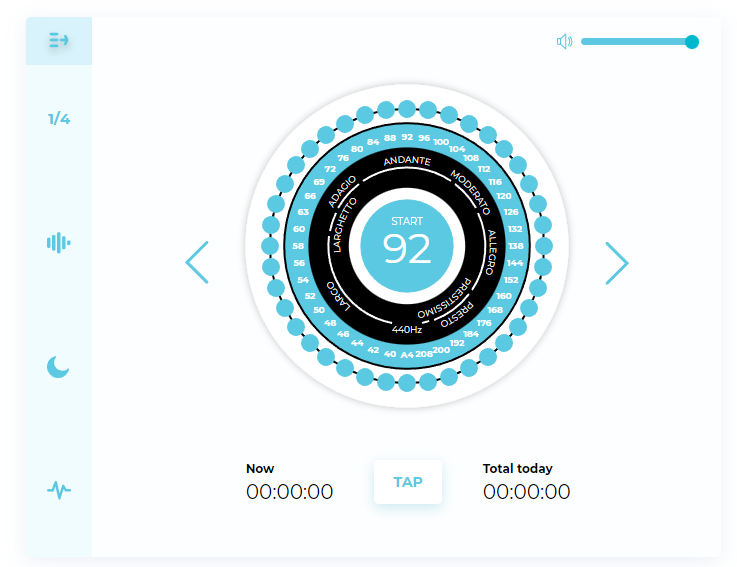
**Metronome Research**

What is a Metronome?

A metronome is a device that produces a sound at a regular interval that can also be changed by a user. This is typically measured in beats per minute.



[src:](https://www.google.com/search?q=google+metronome&client=opera-gx&hs=ITb&sxsrf=AJOqlzWaP9_L4pNTZ35dKLRmgIBgTiw8cw%3A1673429132821&ei=jIC-Y6W6Mcfd7_UPtsK36AU&oq=google+metron&gs_lcp=Cgxnd3Mtd2l6LXNlcnAQAxgAMgcIABCxAxBDMgUIABCRAjIFCAAQkQIyBQgAEIAEMgUIABCRAjIFCAAQkQIyBQgAEIAEMgUIABCABDIFCAAQgAQyBQgAEIAEOgQIIxAnOhAILhCxAxCDARDHARDRAxBDOgoIABCxAxCDARBDOgQIABBDOgsIABCABBCxAxCDAToLCAAQsQMQgwEQkQI6DQgAEIAEELEDEIMBEAo6BwgAEIAEEApKBAhBGABKBAhGGABQAFj8CmDtD2gAcAF4AIABaIgB2QeSAQQxMS4ymAEAoAEBwAEB&sclient=gws-wiz-serp) Google has a built in metronome to their system.



[src:](https://www.metronomeonline.com) Free online metronome

Advantages(Web based):

This is useful as google is standardly accessible across a range of devices with the condition that they have internet access.

This means they can be accessed by a large range of users.

As a web based application they can offer a range of features, dark mode, variable volume, time signature, what noise is made

They can be updated and the user has no further difficulties, the feature is automatically rolled out

Disadvantages(Web based):

They require access to the internet on a device

They require a device itself

Limited to whatever a web browser can do, typically HTML, Javascript



[src:](https://play.google.com/store/apps/details?id=com.eumlab.android.prometronome&hl=en_US&gl=US&pli=1) Pro metronome app

Advantages(Application):

Application based apps can be downloaded once and then be used whenever

Easy to update and work as an old version until internet access for update is found

Disadvantages(Application):

Requires a device that can have the application(may be device locked, region locked etc.)

Can only be used when the device isn’t doing something else(updates, ran out of battery)

Limited to typically mobile devices unless an emulator used but there are better options



[src:](https://www.amazon.co.uk/Theodore-Wooden-Mechanical-Metronome-Keyboards/dp/B0055D9SIC/ref=asc_df_B0055D9SIC/?tag=googshopuk-21&linkCode=df0&hvadid=310778821341&hvpos=&hvnetw=g&hvrand=14450819785919279663&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=1007266&hvtargid=pla-562952287859&psc=1&th=1&psc=1) A classic metronome offered on Amazon

Advantages(physical):

Doesn’t require a device with access to applications or the internet to use

Very robust as they can’t go down like websites, or applications or devices

Disadvantages(physical):

Once made they can’t be changed without having to remake the metronome

Guaranteed to be paid for when first bought

Limited by physical factors like weight, size, look  
Eventually stop working or stop working correctly/efficiently



[src:](https://www.thomann.de/gb/korg_kdm_3_digital_metronome_black.htm) A physical digital metronome

Advantages(digital vs mechanical):  
More robust as less moving parts

Can build more complex circuitry for complex features

Disadvantages(digital vs mechanical):

Requires some sort of power for electronics

Costs more as more expensive parts are required

Advantages(Paid):

Company is provided with greater budget that can fund a better product

Filtered feedback to only those interested and willing to pay

Disadvantages(Paid):

Less users get access to the metronome as many won’t want to pay

Less feedback as less users

## Essential Features

My solution must allow you to set the BPM of the metronome, start/stop the beat and provide a visual implementation and audible noise every beat.

The solution must work on any web enabled device with a clear, touchscreen friendly interface

There should be limited text so it’s suitable for anyone.

It should be freely accessible online.

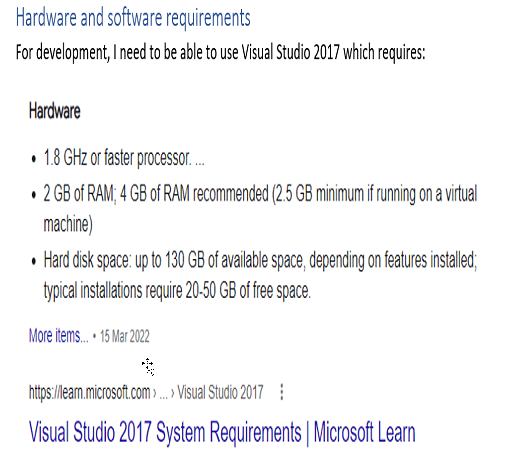
## Limitations

There is insufficient time to add additional features but these could be added later. My solution will not allow you tom compare your playing to the beat, there will be no memory of users and no tracked data. A feature that could be later added would also be a customisable BPM over a set time period allowing musicians to practice specific pieces or techniques.

There is no requirement to make a native android or apple app: the metronome will be purely web based in order to make it freely available to as many people as possible.

## Hardware and Software Requirements

For development, I need to be able to use Visual Studio 2017 which requires:



<https://learn.microsoft.com/en-us/visualstudio/releases/2017/vs2017-system-requirements-vs>

For the sake of the stakeholders to run the metronome they need it to run on the latest version of chrome available on tablets, phones and PCs.

My stakeholder has an android mobile phone

|  |  |
| --- | --- |
| Screen size: |  |
| OS: |  |
| Storage: |  |
| RAM: |  |

## Success Criteria

|  |  |  |
| --- | --- | --- |
| Number | Criteria | Justification |
| 1 | Must be accessible on an android 12 device on chrome | Stakeholder has an android 12 device with a reliable WiFi connections. Any updates can be automatically rolled out |
| 2 | User can set the BPM | The stakeholder needs to modify BPM to practice between 50-120BPM |
| 3 | Any invalid BPM will be automatically corrected to the closest sensible value between 50-120BPM | The stakeholder wants to focus on playing guitar and might accidentally type in invalid data |
| 4 | There should be a start and stop button that toggles when you press it | The user should be able to control the metronome with their finger with a really simple UI |
| 5 | The user should be able to increase the BPM by 5 using a touch button | The stakeholder needs to be able to easily modify the speeds by a common increase so they can practice different speeds |
| 6 | The user should be able to decrease the BPM by 5 using a touch button |
| 7 | There should be an audible beep every beat | If they are focusing on sheet music or the instrument they will want an audible cue to play alongside |
| 8 | There should be a visual cue every beat | People may not have hearing difficulties or not want to be using sound so require a visual cue |
| 9 | There should be a high contrast mode button which toggles a black and white colour scheme with larger text | Sometimes the metronome will be on a small screen or far away and users will need an easier visual experience so they don’t mistake the numbers |

# Design

## Algorithms

The user should be able to enter the BPM score. The browser needs to know how long to pause between each tick in milliseconds. This can be done using the following algorithm

BPM = user input  
interval = 60000 / user input

## Usability features

**-**

**+**

BPM

60

## Variables and validation

|  |  |  |
| --- | --- | --- |
| Variable | Data type | Validation |
| BPM | Integer | Range check(between 50-120) |
| BPMUserInput | String | Presence check and Type check |
| IntervalMS | Integer | Make sure it’s rounded to 0 dp |
| HighContrastMode | Boolean | Checkbox can be ticked or not ticked |
| IsPlaying | Boolean | Either true or false |

# Testing

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Test Number** | **Description** | **Success Criteria** | **Test Data** | **Expected Result** | **Actual result** |
| **1** | **Basic web page** | **1** | **Page load** | **A web page with a title and text box to enter the BPM score displays in chrome** | **Passed** |
| **2** | **BPM** | **2** | **120** | **Valid data accepted** | **Passed** |
| **3** | **BPM** | **2** | **50** | **Valid data accepted** | **Passed** |
| **4** | **BPM** | **2** | **60** | **Valid data accepted** | **Passed** |
| **5** | **BPM** | **3** | **130** | **BPM set to 120** |  |
| **6** | **BPM** | **3** | **30** | **BPM set to 50** |  |
| **7** | **BPM** | **3** | **“”** | **BPM set to 50** |  |
| **8** | **BPM** | **3** | **Potato** | **BPM set to 50** | **Passed** |
| **9** | **Increasing BPM** | **5** | **BPM set to 60 Press increase** | **BPM increases up to 65** |  |
| **10** | **Increasing BPM** | **5** | **BPM set to 120 Press increase** | **BPM stays at 120** |  |
| **11** | **Increase BPM** | **5** | **BPM set to 119** **Press increase** | **BPM increases to 120** |  |
| **12** | **Decreasing BPM** | **6** | **BPM set to 60 Press decrease** | **BPM stays at to 60** |  |
| **13** | **Decreasing BPM** | **6** | **BPM set to 120 Press decrease** | **BPM decreases to 115** |  |
| **14** | **Decreasing BPM** | **6** | **BPM set to 61** **Press decrease** | **BPM decreases to 60** |  |
| **15** | **Playing noise** | **7** | **BPM set to 60** | **60 beats should play in a minute at regular intervals** |  |
| **16** | **Playing noise** | **7** | **BPM set to 120** | **120 beats should play in a minute at regular intervals** |  |
| **17** | **Playing noise** | **7** | **BPM set to 77** | **77 beats should play in a minute at regular intervals** |  |
| **18** | **Button to start** | **4** | **Button is paused** **Button is clicked** | **Should change to stop** |  |
| **19** | **Button to stop** | **4** | **Button is started** **Button is clicked** | **Should change to start** |  |

## Post development Testing

Here are some questions to give my stakeholders after I’ve finished developing the solution:

Functionality  
What did you want the program to do? What did you click on (exactly, in what order?) What happened? Did the program do everything you wanted it to do? Were there any features that you wished were there but weren’t?

Robustness  
Did the program crash? If so, when (what did you do immediately before? What were you trying to do?)

Usability

# Implementation

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# Installation

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# Maintenance

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